WHAT IS CLAIMED IS:

1. A method of forming a multi-layer dielectric structure, the method comprising:

forming a first dielectric layer on a substrate according to a CVD process; and

forming a second dielectric layer directly on the first dielectric layer according to an ALD process.

2. The method according to Claim 1, wherein the first dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

3. The method according to Claim 1, wherein the second dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

4. The method according to Claim 1, wherein the first dielectric layer includes HfO_2 and the second dielectric layer includes Al_2O_3.

5. The method according to Claim 1, wherein forming a first dielectric layer comprises forming the first dielectric layer at a temperature in a range from about 25°C to about 700°C and a pressure in a range from about 1×10^{-6} Torr to about 760 Torr during the CVD process, and wherein forming a second dielectric layer comprises forming the second dielectric layer at a temperature in a range from about 25°C to about 700°C and a pressure in a range from about 1×10^{-6} Torr to about 760 Torr during the ALD process.

6. A method of forming a multi-layer dielectric structure, the method comprising:

forming a first dielectric layer on a substrate according to an ALD process; and

forming a second dielectric layer directly on the first dielectric layer according to a CVD process.

7. The method according to Claim 6, wherein the first dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

8. The method according to Claim 6, wherein the second dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

9. The method according to Claim 6, wherein the first dielectric layer includes HfO_2 and the second dielectric layer includes Al_2O_3.

10. A method of forming an integrated circuit capacitor, the method comprising:

forming a first electrode on a substrate;

forming a first dielectric layer on the first electrode using a first one of an ALD process and a CVD process;

forming a second dielectric layer on the first dielectric layer using a second one of the ALD process and the CVD process; and

forming a second electrode on the second dielectric layer.

11. The method according to Claim 10, wherein forming a first dielectric layer comprises forming the first dielectric layer in a first chamber, and wherein forming a second dielectric layer comprises forming the second dielectric layer in a second chamber.

12. The method according to Claim 11, further comprising transferring the substrate after forming the first dielectric layer while maintaining a vacuum on the substrate.

13. The method according to Claim 12, wherein transferring the substrate after forming the first dielectric layer while maintaining a vacuum on the substrate comprises transferring the substrate via a transfer chamber configured to be selectively coupled to the first and second chambers.

14. The method according to Claim 10:

wherein the first dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT); and

wherein the second dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

15. The method according to Claim 10:

wherein the first dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT); and

wherein the second dielectric layer comprises one selected from the group consisting of SiO_2, Si_3N_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).

16. An apparatus for forming multi-layer dielectric structures on a semiconductor substrate, the apparatus comprising:

a first chamber configured to form dielectric layers according to a chemical vapor deposition (CVD) process;

a second chamber configured to form dielectric layers according to an atomic layer deposition (ALD) process; and

means for providing a substrate to one of the first and second chambers for formation of a first dielectric layer on the substrate and for automatically transferring the substrate to a second one of the first and second chambers for formation of a second dielectric layer directly on the first dielectric layer.

17. The apparatus according to Claim 16, wherein the means for providing the substrate to a first one of the first and second chambers for formation of a first

dielectric layer on the substrate and for automatically transferring the substrate to the second one of the first and second chambers for formation of a second dielectric layer on the first dielectric layer comprises means for transferring the substrate between the first and second chambers while maintaining a vacuum on the substrate.

18. The apparatus according to Claim 17, wherein the means for transferring the substrate between the first and second chambers while maintaining a vacuum on the substrate comprises a transfer chamber configured to be selectively coupled to the first and second chambers.

19. The apparatus according to Claim 18, further comprising:

a loadlock chamber configured to vacuumize the transfer chamber; and

a cooling chamber configured to maintain a temperature of the transfer chamber.

20. The apparatus according to Claim 16:

wherein the first chamber is configured to form dielectric layers of a material selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT); and

wherein the second chamber is configured to form dielectric layers of a material selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).